

ABSTRACT OF THE INVENTION

Lenticular lenses in a monolithic array, wherein each individual lens element is similar to an immersion lens and integrated one-to-one with total-internal-reflecting light pipes that correspond to individual pixels. Each lens and lightpipe element in the display array collects optical flux from a corresponding pixel while reducing or eliminating optical flux cross-feed between adjacent pixels and projects the flux into an expanded field of view. With a reflective or non-self luminous display device, a large field of view is achieved for the collection of ambient illumination and for viewing the display. Each lens element concentrates and focuses ambient illumination upon one corresponding reflective pixel whereupon the pixel's color is read in the reflected light. The light pipe enhances collection of ambient light illumination, display brightness and display field of view. The inventive lens/lightpipe combination will additionally benefit other applications of a "Cats Eye" type retro-reflector.